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Office Of The Secretary,
Federal Communications Commission
Washington, D.C. 20554

30 May, 1995

SUBJECT: Formal Filing Of Comments in respect to ET DOCKET No. 95-19

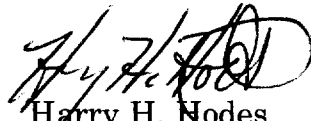
Gentleman,

Pursuant to the applicable procedures set forth in 47CFR Sections 1.415 and 1.419, Electromagnetic Engineering Services, Inc. [EESI], which is an interested party, hereby avails itself of the right to file a formal "Comment" in respect to ET DOCKET No. 95-19.

Because we wish the Commissioner to receive a personal copy of our "Comment", an original and nine copies are herewith attached.

EESI appreciates the opportunity to participate in the rule making process, and thanks the Commission in advance for its consideration of our "Comment". In the event that we at EESI may be of further assistance to the FCC, please do not hesitate to contact the undersigned by telephone at (619) 259 - 4952 or by telefax at (619) 259 - 7170.

Respectfully submitted,


Harry H. Nodes
President & C.E.O.

ORIGINAL

Comment
In Respect To:
Notice Of Proposed Rule Making
ET Docket No. 95-19

(Adopted & Released 7 February, 1995)

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BACKGROUND:

Electromagnetic Engineering Services, Inc. [EESI] is an Independent EMC Testing Laboratory and EMC Consultancy which (among other things) performs fee-for-service testing of personal computers, peripherals and other digital devices manufactured by both US and foreign firms. Approximately 25% of EESI's annual sales volume is derived from tests performed in accordance with 47CFR Part 15B. (For reference purposes, a more detailed profile of EESI is provided in Annex A to this document).

EESI is therefore an interested party with a direct financial stake in the actions that will result from any changes to Parts 2 and 15 of the FCC Rules. It is on this basis that EESI hereby submits its "Comments" in respect to the Notice Of Proposed Rule Making ET Docket No. 95-19 (Adopted & Released 7 February, 1995). EESI appreciates the efforts of the FCC in allowing public comment on this matter.

PURPOSE OF THIS DOCUMENT:

EESI's purposes in submitting a "Comment" on the Notice Of Proposed Rule Making ET Docket No. 95-19 are: a) to inform the FCC of our views on the substantive issues raised in the subject docket, and b) to challenge some elements of the rationale provided (within the subject docket) as justification for the proposed changes, and c) to suggest alternatives and alterations to the proposals contained in the subject docket.

EXECUTIVE SUMMARY:

The three substantive issues raised in the subject docket are: a) the proposed move to a Declaration of Compliance-based system for digital devices qualified to FCC Part 15B Class B (and the abandonment of the current system of Filings and Approvals that is based on detailed FCC review of those Filings); b) the proposal to mandate Test Laboratory Accreditation, based on the NIST-run NVLAP program; and, c) the proposal to institute what might be called "Component Certification" for the various major subassemblies that make up today's (Modular) Personal Computers.

As to the first issue, EESI wishes to state its qualified support for the proposed move to a "Declaration of Compliance-based Approach" for digital devices qualified to FCC Part 15B Class B (and the abandonment of the current system of Filings and Approvals that is based on detailed FCC review of those Filings). As with any proposed change in long-standing regulations, the "devil is in the details", and it is the details of this proposal that are worrisome to us. Specifically, we are deeply concerned that in the final rule making on this issue, the FCC will insure that the following points are adopted:

- that the Declaration Of Compliance [DOC] must be based on *actual* testing of the *actual* product, and **not** merely be based on a stated intent to be in compliance, nor based on tests performed on a self-declared "similar" product;
- that an actual Test Report (to current standards of scope, applicability, content, and technical quality) continue to be required as an integral part of the DOC-based Approach;
- that Filings continue to be mandatory for FCC Part 15B Class B;
- that the use of a "Compliance Logo" (similar in concept to the CE Mark) and text-based product labeling (identical to or similar to that now required) be required on all products that are being certified either to FCC Part 15B Class A or to FCC Part 15B Class B;
- that all parties (i.e. manufacturers, independent test labs, and importers) be subject to the **same** rules;
- that enforcement activities against willful rules violators **not** be abandoned or neglected;
- that a manufacturer or importer be legally authorized to place his products on the market and to sell his products *immediately after the Filing is made*.

EESI believes that a Declaration of Conformity-based approach that incorporates the above listed points will be inherently fair and reasonable, and will impose the minimum economic burden on industry, while at the same time allowing for effective and efficient control of the EMI levels resulting the widespread use of PC's and similar digital devices. EESI also believes that its views on this matter are broadly consistent with those of its competitors, as well as with those of many of our clients. In the event that Rules are adopted that are broadly consistent with the above listed points, EESI will be pleased to fully support the FCC's actions.

A detailed explanation of the rationale for the above-listed points is provided in the body of our "Comment".

As to the second issue, EESI wishes to state its support for the proposal to mandate EMC Test Laboratory Accreditation, especially if it is based on EN 45001 or on similar higher level ISO Standards. As the same time, however, EESI wishes to go on record as being totally opposed to any accreditation scheme that is based **exclusively** on the NIST-run NVLAP.

It is EESI's strong view that the FCC should seek statutory authority from Congress to be able to perform such accreditations "in-house". Our feeling is that the Sampling and Measurements Branch would best serve for this purpose, with inspection/audit authority being delegated as needed to the FCC Field Engineering Offices. (EESI is willing to support the FCC's request for such additional authority, to the extent of testifying in favor of such a position at a Congressional Hearing).

If for some reason, it is deemed impractical to attempt to obtain such statutory authority, EESI would, as an alternative, support an approach based upon the use of the NIST NVCASE Program to accredit a minimum of five competing Registrars for EMC Test Laboratory Accreditation. Based on its NVCASE Approval, each Registrar would then be free to compete for business from both independent test laboratories and manufacturer's in-house (i.e. "captive") test laboratories based upon prices and service. In such an approach, the FCC would recognize an Accreditation granted by any NVCASE-Approved Registrar of EMC Test Laboratories. An additional key element of such an approach would be the requirement that all laboratories (i.e. independents, in-house ["captive"] labs, and foreign labs) would all be subject to the same Accreditation rules. A final requirement of such an approach would be to prohibit self-accreditation (i.e. to prevent a large firm that owned both an Accreditation Registrar and one or more EMC Labs from using its in-house Accreditation Registrar to accredit its own Labs).

In any event, EESI wishes to register, in the strongest possible terms, its total opposition to *any* accreditation scheme that has the effect of creating a legal monopoly based *exclusively* on the NIST-run NVLAP or *exclusively* on any other single "third party" entity. The record of such "independent" government monopolies in respect to delivered service quality, price of services, and response to market needs is too dismal to enumerate here. It is certainly true that the *de novo* creation of such monopolies runs counter to the current national and international economic and political trends. EESI further notes that the argument that NVLAP should be granted an exclusive monopoly (based on the simple fact of its unique existence) ignores the "real world" economic issues facing the EMC Test Laboratory Industry. Indeed, EESI believes that granting NVLAP a monopoly over Accreditation would ultimately endanger the survival of many Independent EMC Test Laboratories.

A detailed explanation of the rationale for the above-listed points is provided in the body of our "Comment".

As to the third issue, EESI wishes to state it (reluctantly) takes no position on the proposal to institute what might be called "Component Certification" for the various major subassemblies that make up today's (Modular) Personal Computers. EESI's neutrality on this issue arises because we feel that the "points" which can be listed in favor of such a proposal are exactly canceled by the "points" which can be listed against such a proposal.

A detailed explanation of the rationale for our opinion in this matter is provided in the body of our "Comment".

DETAILED EXPLANATION OF EESI's VIEWS ON THE DECLARATION OF CONFORMITY ISSUE:

As indicated in the Executive Summary, EESI wishes to state its qualified support for the proposed move to a "Declaration of Compliance-based Approach" for digital devices qualified to FCC Part 15B Class B (and the abandonment of the current system of Filings and Approvals that is based on detailed FCC review of those Filings). As with any proposed change in long-standing regulations, the "devil is in the details", and it is the details of this proposal that are worrisome to us. In respect to this issue, EESI hereby offers the following suggestion "points", and our rationale for each "point":

First, EESI believes that the Declaration Of Compliance [DOC] must be based on *actual* testing of the *actual* product, and **not** merely be based on a stated intent to be in compliance, nor based on tests performed on a self-declared "similar" product. EESI is strongly opposed to the concept of "Self-Certification", and assumes that the actions proposed in the subject docket are not a stalking horse for the eventual abolition of conformance testing. *Our position is based on the fact that compliance with systems-level EMC requirements can only be assessed by testing at the systems level*. The current and near-term projected state of the art simply does not hold any hope that the real-world EMI levels of complex devices like PCs can be predicted with accuracies and repeatibilities better than about +/- 20 dB.

Second, EESI believes that an actual Test Report (to current standards of scope, applicability, content, and technical quality) must continue to be required as an integral part of any DOC-based Approach. The reason for this is almost self-evident; if there is no test report, there is no evidence (in both the technical and legal senses) that any testing was performed.

Third, EESI believes that Filings must continue to be mandatory for FCC Part 15B Class B devices. In this regard, EESI's view is that the current procedures for assignment and use of the Grantee Code and the FCC ID # should be continued, and copies of the DOC and the associated Test Report and required Fees would be required to be Filed with the FCC using the relevant FCC Form. In EESI's view, the continued existence of the Filing requirement would serve several useful purposes; among these are:

- that the availability of Filing documents (correlating FCC ID#, manufacturer's name and address and test lab's name and address) would allow EMI problems to be traced back to the responsible manufacturer or importer, thus allowing effective enforcement of the regulations at what is often the source of the problem, and,
- that since the Filings would continue to be matters of public record, each manufacturer and each independent test laboratory could periodically examine the filings to insure that his competitors are in conformance with the regulations. In

- this regard, the members of the "interested public" would be serving as "private Attorneys-General", and would, over time, enhance overall industry compliance with regulations. This process would be far more effective if all Filings were copied to CD-ROM along with both PC and Mac Compatible Search Engine Software, and made available on a user-fee basis (say \$150 per disk). (If the FCC lacks the internal resources or expertise to do this, than any number of private firms (including EESI) would be delighted to do it for the FCC!), and,
- that Filing requirements provide a *visible* means of demonstrating to the "interested public" that valid regulations exist, and that they are liable to be enforced. EESI's position is that if there is no intent to enforce Rules, than the Rules should be abolished. We hold this view because the purpose of Rules is to positively influence behavior, and behavior is not influenced positively through "empty rituals" that are void of substance.

Fourth, EESI Believes that the use of a "Compliance Logo" (similar in concept to the CE Mark) and text-based product labeling (identical to or similar to that now required) be required on all products that are being certified either to FCC Part 15B Class A or to FCC Part 15B Class B. EESI believes that the mandatory use of such a logo and labeling scheme would confer a marketing advantage for each manufacturer in a manner similar to the EPA "Energy Star" Logo that is now becoming widely used. Thus, we believe that such a Rule would be very popular with manufacturers.

EESI strongly recommends that in respect to any proposed "Compliance Logo", the FCC follow the example of the Department of Defense in its handling of the ADA™ computer language. Specifically, the DoD defined both the name "ADA" and designed the "ADA Logo", and then had both of these items registered as *trademarks* with the US Patent And Trademark Office. The DoD non-exclusively licenses the use of ADA Logo *only* to those private corporations that fully comply with its requirements. The DoD also zealously prosecutes anyone who abuses or illegally "appropriates" the ADA Trademark).

Fifth, EESI believes that all parties (i.e. manufacturers, independent test labs, and importers) **must** be subject to the same rules. EESI is particularly concerned to assure that manufacturers who are utilizing their in-house laboratory resources be held to precisely the same testing, paperwork and fee schedule requirements as would be imposed on independent test labs. To allow manufacturers who are utilizing their in-house laboratory resources to be held to a lower standard than that imposed on independent test labs would not only damage the economic interests of independent test labs, but also would damage the economic interests of their many clients. Such a situation would unfairly favor the large industrial firm over the smaller and more entrepreneurial firm. In any event, such preferential treatment does not comport with the fundamental

standards of fairness and equality of market access that our legal system is supposed to provide.

Sixth, EESI believes that enforcement activities against willful rules violators **must** not be abandoned or neglected. In EESI's view, to abandon or neglect enforcement activities against willful rules violators would have three very bad effects. Specifically, it would convert a clearly needed regulatory activity [i.e. the control of EMI] into an empty ritual. Also, it would seriously disadvantage those manufacturers and point-of-sale systems integrators who have made a economic commitments (in both the technical and marketing arenas) to compliance with the Rules by rewarding what is essentially lawless or negligent behavior. Third, it would have the long term effect of reducing the economic competitiveness of US industry because it would, in effect, economically reward the manufacturers and sellers of substandard products by allowing them *cost-advantaged* access to US markets).

Notwithstanding the "compel-ance" aspects of our comments in the above paragraph, it is EESI's perception that the FCC may not have done a fully satisfactory job at educating the "interested public" about the relevance, applicability, and advantages of compliance with the *existing* Rules. This lack of public education may well account for a large part of the non-compliance problem with respect to the existing Rules. (This appears to be especially true in the case of the large number of so-called "point-of-sale manufacturers" who build PCs in their stores on a customized basis for direct sale to end users). In our view, most business people are law abiding citizens, and as such, will try to conform to the regulations if they can possibly afford to do so.

For instance, EESI personnel have often wondered why the FCC has not prepared a simple one or two page mass mailing to all computer stores in the USA stating that there are EMI prevention-related Rules applicable to PCs, and stating why these Rules are important. The letter would also state that questions on these Rules can be answered either by the FCC or by any independent test laboratory. Such a letter should provide either a list of nearby labs, or the instructions to use the FCC PAL System to obtain a list of nearby labs. The tone of this letter should be one of appealing for aid in furthering the public interest while at the same time enhancing the profit margin. In this era of commercially-available \$100 CD-ROMs that contain phone books listing 6 million US business addresses and phone numbers (and a search engine that works by business category), the preparation and mailing of such a letter would be a relatively simple matter. If the FCC lacks the internal resources or expertise to do this, than any number of private firms (including EESI) would be delighted to do it on behalf of the FCC.

Seventh, EESI believes that a manufacturer or importer must be legally authorized to place his products on the market and to sell his products **immediately** after the Filing is made. In EESI's view, this would eliminate

the excessively lengthy and often unpredictable time-to-market lag that is built in to the current system. The subject docket contains a statement quoting the ITI to the effect that \$250 Million would be saved annually by industry if the regulatory-approval delays are eliminated on short life-cycle products. Notwithstanding our strong support for Rule changes that would allow products to be marketed and sold immediately after a Filing is made, we at EESI feel that the quoted \$250 Million in savings is a grossly misleading figure. In fact, the \$250 Million figure is an imputed "opportunity cost", and not actual lost revenue, because *every* manufacturer is subject to a regulatory approval delay of, on the average, 35 days. However, it is common knowledge that in some cases, the regulatory approval delays are far longer than this. In these instances, the effects on a manufacturer can be truly catastrophic. Based on discussions with some of our competitors and many of our clients, we at EESI believe that the *real* economic loss (as opposed to the imputed opportunity cost) to US industry is closer to \$20 Million to \$30 Million per year; we further believe that these losses fall disproportionally on small and medium sized firms. In view of this, EESI's strong support for a change to the Rules (i.e. a change that would allow a manufacturer to place his products on the market and to sell his products immediately after the Filing is made) is based on the elimination of the **unpredictability** of the time-to-market lag that is built in to the current system.

DETAILED EXPLANATION OF EESI's VIEWS ON THE LABORATORY ACCREDITATION ISSUE:

EESI wishes to state its support for the proposal to mandate EMC Test Laboratory Accreditation. We are especially in favor of the adoption of an accreditation process that would be based on something like the EU's EN 45001 and/or the higher level ISO Standards. As the same time, however, EESI wishes to go on record as being totally opposed to any accreditation scheme that is based exclusively on the NIST-run NVLAP program. Our opposition to the NIST-run NVLAP program being the sole accreditation source is based on two main "points":

- First, EESI believes that for efficiency reasons, EMC Test Laboratory Accreditation in respect to FCC Rules (i.e. Parts 15 and 18) should be the FCC's responsibility and not NIST's. EESI notes that the FCC and the EMC Testing Industry have had many years of successful cooperation. During the last decade, it has been that repeatedly demonstrated that the FCC is fully competent and qualified to oversee the qualifications of EMC Test Laboratories in respect to Part 15 and Part 18, and that the various EMC Test Laboratories will respond affirmatively to FCC leadership on technical and managerial issues. Indeed, the relationship that the FCC has with the EMC Testing Industry as a whole is a good example of an *effective* Public-Private Partnership that for the most part, works very efficiently.

In contrast, the NIST-run NVLAP has been fraught with bitter and long-standing disputes between the operators of the program and its purported client base (i.e. EMC Test Laboratories). These disputes are rooted in policy, perceived technical competence, and personality issues, as much as in economic issues. EESI believes that it is sufficient to note two key facts: a) that only 20 or so Test labs (out of more that 250 US EMC Test Labs) have felt that NVLAP accreditation is worth pursuing, and b) that the EMC Offices Of Primary Responsibility [OPRs] for US Army, US Navy, and US Air Force individually stated (at the DoD's E³ Conference in February 1995) that there has never been any added economic value derived by the Services from the use of NVLAP Accredited Labs (over non-NVLAP Labs), and that from a DoD perspective, the entire NVLAP is a waste of time and effort.

- Second, any accreditation scheme that is based exclusively on the NIST-run NVLAP (or *exclusively* on any other single "third party") has the effect of creating a legal monopoly. The record of such "independent" government monopolies in respect to delivered service quality, price of services, and response to market needs is too lengthy and too dismal to

enumerate here. However, it is worth pointing out that the *de novo* creation of such monopolies runs counter to the current national and international economic and political trends. In any event, it is clear that the NVLAP fee schedule (which EESI knows from direct experience can easily reach \$20,000 or more per Lab per year as opposed to the \$5,000 to \$7,500 claimed in the subject docket) will not face any downward price pressure if the NVLAP is "gifted" with monopoly status.

A close examination of the state of the Independent EMC Test Laboratories in the US will show that most are small business operating in an intensely competitive environment that exerts continuous downward price pressure on each lab. In California (where EESI is located), the current prolonged recession has reduced the business volume of every lab, and many labs are in fairly serious financial condition as a result. Additionally, the rapid pace of change in the EU's EMC requirements has caused many US EMC Test labs to undertake massive capital equipment expenditures in order to remain competitive. Based on our experience with ISO-9000 qualification, we believe that if NVLAP is, in effect, granted a monopoly, the first-time costs could easily reach \$50,000 or more per lab. This figure is especially likely if the accreditation system is to be based on something like EN 45001 and/or the higher ISO Standards. Costs like these will undoubtedly bankrupt many of the smaller labs, and will measurably weaken the larger labs.

Also, EESI personnel have heard rumors that there is serious consideration being given to granting exemptions from the Accreditation requirements to manufacturer's in-house (i.e. "captive") labs. Such a situation would unfairly favor the large industrial firm over the smaller and more entrepreneurial firm. If the FCC adopts such an unfair approach, the result may well be the wholesale destruction of the Independent segment of the EMC Test Laboratory industry. We at EESI do not believe that bankrupting 100 or more small Test Laboratories is in the national interest. In any event, such preferential treatment does not comport with the fundamental standards of fairness and equality of market access that our legal system is supposed to provide.

It is EESI's strong view that the FCC should seek statutory authority from Congress to be able to perform EMC Laboratory Accreditations "in-house". Our feeling is that the Sampling and Measurements Branch would best serve for this purpose, with inspection/audit authority being delegated as needed to the FCC Field Engineering Offices. EESI is fully willing to support the FCC's request for such additional authority, to the extent of

volunteering to testify (at no cost or obligation to the government) in favor of such a position at a Congressional Hearing.

If for some reason, it is deemed impractical to attempt to obtain such statutory authority, some other alternative approach will be required. EESI suggests that whatever alternative is adopted should be based on market competition, and **not** be based on the truly awful idea of granting NVLAP a monopoly on EMC Test Laboratory Accreditation.

EESI suggests as an alternative to FCC-performed EMC Laboratory Accreditations, that the NIST NVCASE Program be used as a vehicle to accredit a minimum of five competing Registrars for EMC Test Laboratory Accreditation. (EESI believes that a minimum of five Registrars are needed to insure effective competition; one of these Registrars would obviously be the NVLAP).

Based on its NVCASE Approval, each Registrar would be free to compete for business from both independent test laboratories and manufacturer's in-house (i.e. "captive") test laboratories based upon prices and service. In such an approach, the FCC would recognize an Accreditation granted by any NVCASE-Approved Registrar of EMC Test Laboratories. An additional key element of such an approach would be the "fairness requirement" that all laboratories (i.e. independents, in-house ["captive"] labs, and foreign labs) would be subject to the same Accreditation rules. A final requirement of such an approach would be to prohibit self-accreditation (i.e. to prevent a large firm that owned both an Accreditation Registrar and one or more EMC Labs from using its in-house Accreditation Registrar to accredit its own Labs).

DETAILED EXPLANATION OF EESI's VIEWS ON THE MODULAR COMPUTER COMPONENT TESTING ISSUE:

As stated in the Executive Summary, EESI wishes to state it (reluctantly) takes no position on the proposal to institute what might be called "Component Certification" for the various major subassemblies that make up today's (Modular) Personal Computers. EESI's neutrality on this issue arises because we feel that the "points" which can be listed in favor of such a proposal are exactly canceled by the "points" which can be listed against such a proposal.

EESI is aware of the need to do something about the so-called "point-of-sale manufacturers" who are widely ignoring the requirements for having the PCs that they build tested at the systems-level in accordance with the FCC Part 15B Rules. As we understand it, the FCC's position is that using their enforcement powers to levy fines against these small businesses is impossible in today's political climate. Consequently, the FCC is seeking the means to "dry up" the supply of "noisy" computer components that are currently being integrated into these PCs. (The idea being that if only "quiet" components are on the market, than the integration of these "quiet" components into PC systems will result in improved EMC overall). EESI believes that from a political standpoint, this idea appears to have some merit.

Unfortunately, EESI believes that the probabilities for success with this approach are slim at best. The first problem with this approach relates to the laws of physics. It is well known that the EMC properties of a System are, for the most part, determined at the systems-level, rather than at the component level. Indeed, the initial (and universal) reaction among both EMC Engineers and Digital Circuit Board Designers to the details of the FCC's proposal in the subject docket is derisive laughter. Closer analysis of the proposal on both theoretical and experiment grounds only serves to confirm the first impression that the idea is inherent unworkable.

The second problem with the proposal in the subject docket is that based upon our experience, we very much doubt that the current and near-term future state of the art in computer system design will permit the design and production of "naked" motherboard/clock/microprocessor/video board/video monitor combinations that could pass the Part 15B Class A limits without benefit of case (given current and projected clock speeds and video bandwidths). However, if we grant, *arguendo*, the possibility that the marketplace can somehow produce motherboard/clock/microprocessor/video board/video monitor combinations that could pass the Part 15B Class B limits without benefit of case, one would still be faced with the fact that the proposal would not ban the conventional "noisy" components (which could still be used to make PCs that are supposedly to be tested at the systems-level). In EESI's view, the "noisy" components will still be used by those "low ball" point-of-sale manufacturers who are seeking to underprice the "name brand" manufacturers. EESI believes that under such

circumstances, those "low ball" manufacturers will protest just as loudly if challenged by the FCC as they do today. It is inevitable that they will still argue that the government is forcing them out of business by raising their costs to the point where they can no longer compete. Consequently, EESI believes that the effort will not be worth the results.

Unfortunately, we at EESI have no constructive alternative to offer that would be *very likely* to successfully address the problem posed by the so-called "point-of-sale manufacturers" who are widely ignoring the requirements for having the PCs that they build tested at the systems-level in accordance with the FCC Part 15B Rules. Some members of our engineering staff believe that significantly tightening the regulations on PC cases (by imposing stringent shielding effectiveness requirements) would be most likely to produce a general improvement in the EMC properties of computers manufactured by the so-called "point-of-sale manufacturers". Nonetheless, we recognize that even the best case will be ineffective as a Faraday Cage if the required gaskets, screws and cover plates are omitted during the integration process. *Because EESI is in agreement with the FCC that something needs to be done about this problem, we take the position that the proposal in the subject docket is worth trying.*

In fact, our main concern about the proposal in the subject docket is the "demoralizing" effect that it will have on "legitimate" manufacturers of all sizes if it is adopted. Undoubtedly, they will feel discriminated against, and will want to know why they should spend money on EMI control when their competitors do not have to do so.

A possible partial solution to this problem may be to convince the so-called "point-of-sale manufacturers" that getting their systems tested is a good idea. As we stated earlier in this document, EESI personnel have often wondered why the FCC has not prepared a simple one or two page mass mailing to all computer stores in the USA stating that there are EMI prevention-related Rules applicable to PCs, and stating why these Rules are important. In our view, most business people are law abiding citizens, and as such will try to conform to the regulations if they can possibly afford to do so. As an inducement to comply, the FCC may wish to consider a "volume waiver" approach, whereby any "point-of-sale manufacturer" that does less than, say, \$1,000,000 of PC sales per annum could qualify an entire product line based a single systems-level test of a *worst-case* combination of components. In such a scenario, a "point-of-sale manufacturer" that offers a product line that includes large desktop, mini-tower, large tower, and "lunchbox" portable PCs could qualify the entire line for under \$10,000 per year. (In the San Diego, CA point-of-sale manufacturers marketplace, \$10,000 equates to the sale price of about six mid-range PCs).

ANNEX A: Corporate Profile Of EESI

1.0 CORPORATE HISTORY

Electromagnetic Engineering Services, Inc. ("EESI") has been providing EMI/EMC design consultancy and test engineering services to industry and government clients since 1976. EESI was originally the *EMC/TEMPEST Laboratory Division* of Science Applications International Corporation ("SAIC")¹. In February of 1993, SAIC sold its EMC/TEMPEST Laboratory Division to *Electromagnetic Engineering Services, Inc.*, which is an employee-led consortium headed by Mr. Harry H. Hodes, who now serves as the President of EESI. EESI's annual sales exceeded \$520,000 in CY1994.

2.0 CORPORATE LOCATION

EESI's current facilities include an EMC Test Laboratory, office space, and an outdoor Open Area Test Site (OATS) that has been fully approved by the Federal Communications Commission (FCC). EESI occupies (under a long-term lease) approximately 5000 square feet of the ground floor of a 2 storey industrial building located in the Sorrento Valley area of San Diego, California. (The OATS, which approximately 3750 square feet in size, is located behind the building in a barrier-protected exclusion area. EESI's address is 11696 Sorrento Valley Road, Suite F, San Diego, California 92121; EESI has been located at this address since December 1986.

3.0 CORPORATE TRACK RECORD IN PRODUCT-RELATED EMC TESTING AND MITIGATION ENGINEERING SERVICES

EESI provides product-related electromagnetics test and evaluation services to a broad range of commercial, industrial, military and civil government clients. EESI's clients spans the entire range of economic strength from small entrepreneurial research and development organizations and tiny startup manufacturing firms to Fortune 500 businesses (such as AT&T). EESI serves each customer in its client base with equal responsiveness and technical proficiency.

EESI's major commercial and military EMC testing and mitigation engineering clients include some twenty of the major U.S. commercial aerospace and military avionics companies, as well as numerous PC and Mainframe computer manufacturers, medical instrumentation manufacturers, the Japan Space Agency, the U.S. National Aeronautics and Space Administration (NASA), and the U.S. Department of Defense (DOD).

The EMC Testing and Mitigation Engineering client base at EESI is segmented into three categories - i.e. "Commercial EMC", "Military/Aerospace EMC", and, "TEMPEST". Some of the major customers served in each category, and the associated projects are presented in the tables on the following pages.

A partial listing of EESI's recent Commercial EMC Clients (and their Test Programs) is given on the next page in Table 3.1-1.

¹ SAIC is the eighth largest privately owned high technology research, development, and manufacturing corporation in the United States; its annual sales are in excess of \$1.4 Billion.

**Table 3.1-1: Some Of EESI's Commercial EMC Clients
and their Equipment Test Programs**

COMMERCIAL SYSTEMS	Client:	Tests performed and Description of System:
	Anacomp	FCC Part 15B Class A on a micrographics device
	AT&T Global Information Solutions	FCC Part 15B Class A on NCR Mainframe Computers
	BCAF Startronics	FCC Part 15C Class A Tests on a car alarm system
	Directed Electronics, Inc.	FCC Part 90 Tests on an RF Modem System
	Digivision, Inc.	FCC Part 15B Class A Tests on a Graphics Terminal
	General Instruments (VideoCipher Division)	FCC Part 15B Class B Tests on a complete product line of Cable TV Set-top Products
	General Instruments (VideoCipher Division)	FCC Part 15B Class B Lot-Sampling Quality Assurance Test on the GI Model 310D Cable TV Set-top Product
	General Instruments (VideoCipher Division)	FCC Part 15B Class A Tests on Satellite and Cable TV Head-end Equipment
	Communications Consultants, Inc.	FCC Part 90 Tests on a Mobile FM Radio
	Coded Communications	FCC Part 15C and Part 90 Tests on an Intelligent RF Modem System
	HM Electronics, Inc.	FCC Part 15B Class A Tests on an Intra-building Audio Intercom System
	Industrial Computer Source	FCC Part 15B Class A Tests on an entire product line of Rackmount Industrial PC Computer Systems IEC 801.2, IEC 801.3, IEC 801.4, IEC 801.5 Tests on Rackmount Industrial PC Computer Systems
	Infrasonics	FCC Part 15B Class A and IEC 801.3 Tests on Adult and Infant Patient Ventilator Systems
	Johnson & Johnson / Codman	FCC Part 15B Class A and IEC 801.2, IEC 801.3, IEC 801.4, IEC 801.5 Tests on a automated 3-D Surgical Navigation System for Neurosurgery
	Kaiser Electro-Optics, Inc.	FCC Part 15B Class A Tests on two different models of Virtual Reality Headsets
	Lite-On	FCC Part 15B Class B Tests on Power Supplies
	Luma Corporation	FCC Part 15B Class B Tests on a computer-based realtime surgical IR/Visual imaging system
	Micro Alliance	FCC Part 15B Class A Tests on a Rackmount Industrial PC Computer Systems
	ORA Electronics	FCC Part 22 Tests on a Bidirectional RF Amplifier for use with Cellular Telephones
	Primary Access	FCC Part 15B Class A Tests on a high-speed LAN Switching System
	Paralan Inc.	FCC Part 15B Class A Tests on a SCSI Bus Extender
	PICS Previews, Inc.	FCC Part 15B Class A Tests on a CD-ROM-based Video Display System for use as a sales floor advertising tool in Department Stores
	Primary Protection	FCC Part 15B Class A and FCC Part 90 Tests on an Automobile Alarm System,
	SAIC	FCC Part 15B Class A Tests on a Ruggedized, Portable SPARCstation Computer System with a Color LCD Display
	Systems Engineering & Management Co. (SEMCO)	FCC Part 90 Tests on two industrial RF Telemetry Systems
	Solectek	FCC Part 90 Tests on an RF Modem System
	Sys Technology, Inc.	FCC Part 15B Class A Tests on a Pentium-based PC
	TV/COM	FCC Part 15B Class B Tests on a complete product line of Cable TV Set-top Products
	United Totalizer, Inc.	FCC Part 15B Class A Tests on an entire product line of Racetrack Betting Totalizer Systems
	VORAD	FCC Part 15C Tests on an anti-collision radar intended to be mounted on 18-wheel over-the-road trucks
	Safety Systems, Inc.	FCC Part 15B Class A Tests on four Pentium-based PCs
	XI Computers	

A partial listing of EESI's recent Military and Aerospace EMC Clients (and their Test Programs) is given in Table 3.1-2, below:

Table 3.1-2: Some Of EESI's Military/Aerospace EMC Clients and their Equipment Test Programs

AIRCRAFT SYSTEMS		(All Tests To MIL-STD-461 Unless Otherwise Specified)
Berg Systems Inc. (Apollotek Ltd)	Digital Flight Data Recorder for Fokker F-20 Series Aircraft (RTCA-DO-160C Tests)	
Boeing	E4B CAPS Aircraft	
Grumman	JSTARS Radar	
Gulton	Flight Data Recorder (RTCA-DO-160C Tests)	
TRW	LTSP, ICNIA Surveillance System	
USAF	OBEWS Electronic Warfare Trainer	
Parker Hannifin	ARRSI/UARRSI B2 Aircraft Refueling Pod	
AMETEK	B1-B Aircraft	
Harris	COMANCHE Helicopter Electronics Systems	
SPACE SYSTEMS		(Tests To Both MIL-STD-461 and MSFC-521)
Lockheed	STARLAB (Strategic Defense Initiative) Payload	
Grumman	NPBIE (Strategic Defense Initiative) Payload	
SPOT	Polar Ozone Atmospheric Measurement Experiment (POAM) Payload	
Odetics	Joint Earth Resources Satellite	
TRW	VUE	
Remec	GPS II Global Event Detector	
MISSILE SYSTEMS		(All Tests To MIL-STD-461)
GTE/Sylvania SSD	PEACEKEEPER C ³	
Rockwell	PEACEKEEPER MECA	
McDonnell Douglas	GLCM, HARPOON	
Tracor	PADS, DDS	
General Dynamics	SMALL ICBM	
GROUND SYSTEMS		(All Tests To MIL-STD-461 Unless Otherwise Specified)
Cubic	JSTARS Ground Data Terminal, JSTARS Airborne Data Terminal	
US Army	GRIDSE/T, LCU, and LDC Ruggedized Computers; RADIAC Sets	
Singer	TCT and TCS Tactical Communications Systems	
Comarco	CAMPS Tactical Trainer and Debriefing System	
US Army	All electrical power and communications systems within the NATO Alternate Support Headquarters (ASH) at High Wycomb, UK	
Ford Aerospace	DIVAD (Divisional Air Defense System)	
Oceanside Engineering & Manufacturing, Inc.	Flight Line Lubricating Unit (Tests to MIL-STD-461 and to MIL-L-7312E for Dielectric Strength)	
NAVAL SYSTEMS		(All Tests To MIL-STD-461)
US Navy	JTIDS Tactical Data System	
Lockheed	SEAFIRE Liquid Plasma Display	
Rockwell	SUBACS	
Hughes	SA 2112 Submarine Antenna System	
Datametrics	Hardened Printers	

A partial listing of EESI's recent major TEMPEST clients (and their test programs) is given in the following Table.

Table 3.1-3: Some of EESI Recent TEMPEST Clients and Their Proj

COMPANIES	PRODUCTS	TYPE OF EFFORT
Singer/Librascope	SST	NACSIM 5100
Singer/Librascope	TCT	NACSIM 5100A
USAF and AAI	OBEWS	NACSIM 5100A
Datametrics	Keyboard Printer	NACSIM 5100A
Boeing	E-4B, Plasma Display	NACSIM 5100A
Megatek	WHIZZARD	NACSIM 5100A
Basix	Secure Entry Sys.	NACSIM 5100A
Axonix	Dot Matrix Printer	NACSIM 5100A
Comarco	CAMPS	NACSIM 5100
Spectrographics	1082GXT Graphic W/S	NACSIM 5100A
Intergraph	Graphics W/S	NACSIM 5100A
Tracor/Ultron	XBU	Commercial COMSEC
		Endorsement
Simpact	SSP3110	Commercial COMSEC
		Endorsement
CLASSIFIED	NEC Powermate II PC/AT	NACSIM 5100A
CLASSIFIED	Sony WDD-3000/WDC-2000-10	NACSIM 5100A
	WORM	
CLASSIFIED	MAXTOR RXT-800S WORM	NACSIM 5100A
CLASSIFIED	DATAcopy 612F Camera	NACSIM 5100A
CLASSIFIED	RICOH IS-400 Image Scanner	NACSIM 5100A
CLASSIFIED	High Resolution Display	NACSIM 5100A
SAIT	1177 Ruggedized Laptop	NACSIM 5100A
	Computer	
SAIT	1179 Ruggedized Laptop	NACSIM 5100A
	Computer	
SAIC/Dayton	MIPIX	NACSIM 5100A
Titan	MiniDAMA V1	NSTISSAM TEMPEST 1-91
Titan	MiniDAMA V3	NSTISSAM TEMPEST 1-91
SAIT Range Systems	Large Area Tracking Range	NSTISSAM TEMPEST 1-91
VIASAT	Embedded Infosec Processor	NSTISSAM TEMPEST 1-91
Datametrics	IRIS TCCS System	NSTISSAM TEMPEST 1-92 and
	Tactical Printers	COMS 018
Ravenn Data Systems	Fiber Optic Mux (RS-232/RS-422)	NSTISSAM TEMPEST 1-91 and
		COMS 018

4.0 CORPORATE CAPABILITIES

4.1 Introduction

Electromagnetic Engineering Services, Inc. formerly was the SAIC EMC/ TEMPEST Laboratory. Initially (i.e. in the late 1970's), SAIC's EMC/TEMPEST Laboratory provided support to sister SAIC Divisions involved in the manufacture of both commercial and military electronics hardware (systems and subsystems), and in the design and construction of test laboratories, embassy buildings, command posts, and other complex facilities. As this base of business expanded and parties outside of SAIC began to request contract EMC support, two key decisions were made in 1984. First, it was decided to specify, design, develop, and operate a comprehensive, full-scale, fee-for-service, automated EMC Test Laboratory Facility, and to offer "EMI problem-solving" (i.e. Mitigation Engineering) consultancy services directly to electronic equipment manufacturers and government agencies. Second, it was decided to offer specialized (EMC-related) facilities design engineering consultancy services to those organizations (i.e. Architect and Engineering (A&E) firms, civil constructors, environmental engineering firms, electric utilities, hospitals, telemetry/ telecommunications relay site operators, etc.) involved in the planning, siting, design, construction, and operation of complex, EMI-prone facilities.

4.2 Testing Capabilities

Starting in 1984, the EMC Test Laboratory Facility steadily improved its capabilities; in the 28 month period since the buy-out, EESI has made very significant capital investments in instrumentation, support equipment, and facilities, so as to provide a whole series of new and expanded test capabilities. As a result of these investments, EESI now provides its clients with a full-service ("one-stop shopping") automated EMI/EMC testing laboratory that has the capabilities to perform the following commonly required types of tests:

Measurements of Radiated and Conducted Emissions and Susceptibility (on electronic equipment sold for commercial, consumer, industrial, and medical purposes) as per the following US and foreign Specifications:

FCC Parts 15, 18, 22, 90 and 94;
MDS-201-0004; and the new FDA Guidelines; SAMA PMC 33.1,
VDE 0871, Vfg 243, and Vfg 251;
EN 50081, EN 50082, EN 55011, EN 55013, EN 55014, EN 55015,
EN 55020, and EN 55022;
the IEC 801-Series (i.e. IEC 801.2, IEC 801.3, IEC 801.4, IEC 801.5,
& IEC 801.6)

Measurements of Radiated and Conducted Emissions and Susceptibility (on military electronic equipment, commercial avionics equipment, and spacecraft/space-qualified electronic equipment) as per the following US and foreign Specifications:

MIL-E-6051D, MIL-STD-461A/B/C/D and MIL-STD-462A/B/C/D;
DEF-STAN 59-41; RTCA-DO-160C; and, MSFC-SPEC-521B;

Measurements to ascertain TEMPEST vulnerability of Information Technology (IT) Equipment, as per the following National and International TEMPEST Specifications:

NSTISSAM TEMPEST 1-91, NSTISSAM TEMPEST 1-92, NACSIM 5100A,
NACSEM 5112, NACSEM 5203, COMS 018, COMS 029, etc.

Measurements of Electromagnetic Shielding Effectiveness (of enclosures, including rooms and buildings) as per the following US and international Specifications:

MIL-STD-285; NSA 65-6, NSA 65-5, and NSA-73-2A; IEEE-299.

As stated previously, EESI has invested heavily in order to obtain a very comprehensive and efficient suite of test instrumentation and support equipment. Specifically, EESI has at least four complete sets of detection equipment and transducers that (taken together) provide the full range of capabilities needed to perform all of the Radiated and Conducted Emissions and Susceptibility Tests that are required for conventional EMC work. Also, EESI has at least two complete sets of TEMPEST detection systems and transducers, and thus can provide very comprehensive TEMPEST testing services as well. Additionally, EESI has the high power RF Amplifiers, cables, antennas, and field probes needed to perform Radiated Immunity/Radiated Susceptibility Tests (i.e. IEC 801.3/IEC 1000-4-3 and MIL-STD-461 RS03/RS103) at field strengths in excess 20 V/M (up to 50 V/M or higher) over the full frequency range from 10 kHz to 18 GHz. Finally, EESI has a full suite of ESD and Pulse Transient Test Systems; these provide full IEC 801.2, IEC 801.4, IEC 801.5, and IEC 801.6 test capabilities. In order to provide prime power to customer equipment that is slated for the European and Military markets, EESI has installed Motor-Generator Sets that can provide 20+ Amperes per phase of 50 Hz and 400 Hz power.

The majority of EESI's Radiated and Conducted Emissions and Susceptibility Tests and TEMPEST Tests are performed in the three RF Shielded Enclosures ("shielded rooms") located in EESI's Test Laboratory. EESI's RF Shielded Enclosures are of modular-panel type construction; the enclosures were built by LMI and were installed, tested and certified by EESI personnel. One enclosure measures 12 ft. wide by 20 ft. long by 10 ft. high, and the other two enclosures measure 12 ft. wide by 20 ft. long by 9 ft. high. The large enclosure provides a nominal 100 dB of isolation from the environment; the other two enclosures provide a nominal 80 dB of isolation from the environment. All of EESI's shielded enclosures meet or exceed the shielding effectiveness requirements for magnetic fields, electric fields, and plane wave fields as specified by NSA 65-6. EESI revalidates the shielding effectiveness of its shielded enclosures on an annual basis using the test methods specified in MIL-STD-285.

At this point in time, EESI is in the process of constructing an RF Anechoic Chamber. This Chamber will be 28 ft long X 19 ft wide X 10 ft high, and will employ a combination of pyramidal RF absorber and ferrite tiles to provide a nominal 8 ft diameter "Quiet Zone" in accordance with the requirements of IEC 801.3 over the frequency range 27 MHz to 1000 MHz, and in accordance with the requirements of MIL-STD-461D over the frequency range 10 kHz to 18GHz. This Chamber will be operational by 1 August, 1995.

EESI utilizes its self-constructed 3-meter and 10 meter size Open Area Test Site (OATS) as the test site when making commercial and industrial Radiated Emissions measurements. EESI's OATS is FCC-approved (23 August, 1993), and in full conformity to both the ANSI C63.4-1991 specification and to the CISPR 16-1 (1993) Specification.

The combination of three RF Shielded Enclosures and an RF Anechoic Chamber within the EMC Test Laboratory, and the FCC-approved Open Area Test Site, makes it is physically practical for EESI to accomplish up to five independent electromagnetics-related tests simultaneously.

In response to a U.S. Navy requirement for off-site testing, the EESI staff specified, designed, constructed, and deployed a Mobile EMI Measurement System (MEMS) complete with custom software. The MEMS allows cost-effective, automated long-term or short-term monitoring, data collection, display, and analysis of both pulsed and CW environmental EMI levels. MEMS has been used to perform pre- and post-construction EMI Site Surveys at a variety of locations in the USA, and to perform long term monitoring of EMI environments at certain government installations.

EESI is often tasked to make Electromagnetic Radiation Hazard (EM RADHAZ) measurements as an adjunct to its environmental EMI Site Survey activities. By utilizing a series of specifically designed, ANSI-approved *field probes*, the EESI staff is able to assess the potential for RF Radiation Hazards to Personnel, Fuels, and/or Ordnance (including construction explosives). In the USA, EM RADHAZ measurements are typically made in accordance with the ANSI C95.3 Standard; the typically used exposure limit values (ELVs) for personnel are given in ANSI C95.1-1991. (A set of ten military specifications and handbooks address ELVs for Ordnance and Fuel).

In addition to the "commonly used" test capabilities described above, EESI has a comprehensive suite of test capabilities intended for specialized applications; these include an Nuclear EMP/Lightning-strike EMP pulse injection test capability, an antenna design laboratory and an outdoor antenna pattern test range, a 1.2 meter X 1.2 meter (diameter X length) Helmholtz Coil (for producing very high intensity magnetic fields), a HIPOT tester (for insulation effectiveness testing); a suite of AC power-line quality monitoring devices, and a suite of specialized equipment that is used for making Free-Space VSWR, Axial Ratio, and Vertical Field Probe measurements within RF Anechoic Chambers.

In order to assist its clients in solving their site-related and equipment-related EMC problems, the EESI staff provide comprehensive consultancy (Mitigation Engineering) services. The cost-effectiveness of EESI's Mitigation Engineering Services has been enhanced by an in-house development activity that has developed and implemented software for the analysis and display of test data relating to: cable coupling effects, power line and RF filter frequency response effects, radiated and conducted emissions and susceptibility of equipment, and transient susceptibility effects.

4.3 Test Data Collection

EESI has the capability of collecting test data using both automated and manual test methods. Automated data collection for FCC evaluations, MIL-STD 461 test evaluations and for *preliminary* TEMPEST line conduction tests is accomplished using bus-driven Automated Test Equipment (ATE) (i.e. instrumentation) controlled by commercially purchased Hewlett-Packard software, and by EESI-written custom software. The ATE control computers allow the applicable test parameters to be loaded into the test instrumentation; the Equipment Under Test (EUT) is then set in the correct mode for the test, and the test data are then automatically collected by the ATE. The ATE typically presents its results in near-real-time, using graphical and/or tabular formats for output. These data are then output in hard copy form on high speed pen plotters so as to permit post-test analysis and test report preparation.

Where technical circumstance dictate, test data is collected manually; for instance, Quasi-Peak detections made during the final stages of FCC Part 15 and 18 Radiated Emissions tests are manually collected, as are all TEMPEST signal analysis

measurements. Manually collected data is recorded to test data log forms, and is then entered into an automated data reduction system which provides graphical and tabular outputs in hard copy form for use in post-test analysis and test report preparation.

As a routine matter, EESI makes photographs of instrumentation setups, scope displays, and the Equipment Under Test so as to augment the graphical and tabular presentations of test data provided in its final test reports and in its regulatory-agency filings.

4.4 Equipment Resources

EESI presently has four (4) complete sets of detection systems and associated transducers which cover the 10 Hz to 1.0 GHz frequency range. Additionally, EESI has a fifth detection system and transducer set that extends test coverage up to a frequency of 22.0 GHz. These assets include spectrum analyzers, tuned frequency receivers, non-tunable frequency receivers, interference analyzers, oscilloscopes, power line impedance stabilization networks, current probes, electric field antennas, and magnetic field antennas.

4.5 Equipment Calibration

EESI operates a comprehensive equipment calibration program in order to ensure the validity of all test data. EESI's calibration program is fully compliant to the requirements of MIL-STD-45622A and ISO-9000. Specifically, all of EESI's *primary reference standard devices* (e.g. resistor and capacitor decade boxes, vector voltmeters, multimeters, attenuators and terminations, RF power meters (and their detector heads), oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, etc.) and certain *secondary standard devices* (e.g. RF preamplifiers used in FCC Part 15/18 tests) are calibrated by EESI-approved² independent (third party) metrology laboratories, using NIST-traceable standards. In all cases, the metrology laboratory furnishes EESI with Certificates Of Calibration on each item of equipment that has been successfully recalibrated. EESI requires that *newly manufactured equipment* that is purchased or leased be delivered with a Certificate Of Conformity that certifies that the Unit(s) as shipped are in current calibration.

Calibration intervals are normally one year, except when the manufacture advises a shorter interval (e.g. the HP 8568B Spectrum Analyzer is recalibrated every six months) or if US Government directives demand a shorter interval (e.g. the Eaton 533X-11 Impulse Generator is required to be recalibrated every six months for use in TEMPEST testing). Items of equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either by the EESI-approved independent (third party) metrology laboratories, or by the manufacturer of the equipment).

EESI typically determines the Antenna Factors of its test antennas in-house (although third-party Antenna Laboratories or the Original Equipment Manufacturer's Antenna Laboratories are occasionally used). Antennas used for FCC Part 15 and Part 18

² At this time, EESI has qualified a total of five independent (third party) metrology laboratories. All of these laboratories hold NIST-Approvals.

Radiated Emissions testing (and for testing to the equivalent European Norms) are calibrated either against NIST-traceable, FCC-Approved Roberts™ Dipoles, using the methods specified in ANSI C63.5-1991, or, by using the "Three-Antenna Method" specified in ANSI C63.5-1991. In accordance with FCC regulations, EESI recalibrates its suite of antennas used for FCC Part 15 and Part 18 Radiated Emissions tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of EESI's Open Area Test Site. A variety of other kinds of antennas (e.g. log-conic spirals) are calibrated using the procedures specified in SAE ARP-958A.